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CURRENT

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BPA infrastructure projects: ensuring reliable delivery of power

The West Coast energy crisis of 2000/2001 has waned, yet the risks of reduced power reliability and more price spikes caused by transmission system limitations and short supplies of energy remain.



You don't hear or see much in the media these days about the Northwest energy crisis. Economic recession has temporarily reduced the demand for energy, but the Northwest is forecast to be 3,000 megawatts short of power to meet the loads of existing customers. In fact, emergency plans are in place to curtail loads in North Puget Sound and to curtail generation north and east of Spokane if the demand for power outstrips the capacity of the transmission system. New transmission must be built to deliver new generation now being planned and sited. When the economy recovers, demand could once again exceed supply driving prices up if new generation is not brought on line.

BPA has identified 20 projects needed to shore up the region's transmission system. An Infrastructure Technical Review Committee made up of transmission experts from Northwest utilities evaluated the projects on economic and technical grounds to assure that they are indeed necessary and are properly prioritized and designed to provide cost-effective reliable service to the region.

The committee recommended that nine infrastructure improvement projects be given top priority for near-term construction, as they are essential to keeping the Northwest transmission grid operating reliably and economically. The projects are underway or will be starting soon. The proposed completion dates for the projects may be revised as circumstances change. For example, a generation developer may delay or stop work on their plant, causing a transmission project to be put on hold.

The infrastructure projects could involve as many as 800 miles of new high-voltage transmission lines, three new 500-kilovolt substations and control and protection systems to support the safe, reliable operation of these new facilities and related generating facilities. Because of the large amount of work, construction will be spread over about five years.

Before a decision is made to build any of them, each will undergo its own environmental review under the National Environmental Policy Act of 1969. BPA will work with land owners, tribes and regional governments to ensure their input is considered in final decisions.

The problem with the present system

There has been no substantial transmission construction since 1987, despite the fact that during the 1990s the Northwest population and economy grew, with many electricity-intensive industries expanding in the region.

The 500-kilovolt grid is over 30 years old and can no longer carry the increased power capacity. Over the last 15 years, the Bonneville Power Administration has reinforced its 15,000-mile transmission system primarily with fixes such as voltage support devices and advanced controls to avoid the environmental and financial expense of constructing new power lines.

Deregulation of the wholesale power industry in 1992 changed the way utilities must do business. Utilities are now required to operate and manage their power and transmission systems as separate businesses, guaranteeing that all power generators have equal access to transmission. This has increased the amount of transmission system transactions nearly 5 percent annually while peak use of the electrical system increased almost 2 percent annually. The situation is similar to a highway system that, over time, becomes congested as the amount of traffic increases beyond what it was designed to handle.

A number of factors confirm that the transmission grid is stressed. Critical paths are congested, as described on page 3. As the grid is monitored and modeled with computers we find it is less robust and harder to control after an emergency, such as collapse of a transmission tower. By analogy, a car with worn out shock absorbers bounces up and down with each bump in the road. Similarly, we have seen power meters swing for extended periods following events that we thought were minor. When these swings go out of control blackouts can occur.

As demand for power increases, BPA's transmission system may no longer be able to meet reliability standards. National, regional and BPA standards prescribe how reliable the transmission grid must be. Organizations such as the North American Electric Reliability Council develop standards with input from utilities, regulators, consumers and other interested

parties. Standards tell us the events we need to plan for – and survive – such as collapse of a transmission line during a winter storm. Application of some standards were made more stringent after transmission outages in the summer of 1996 that began in the Northwest led to blackouts in nine Western states. Grid reinforcements are needed to meet the standards and ensure reliable service.

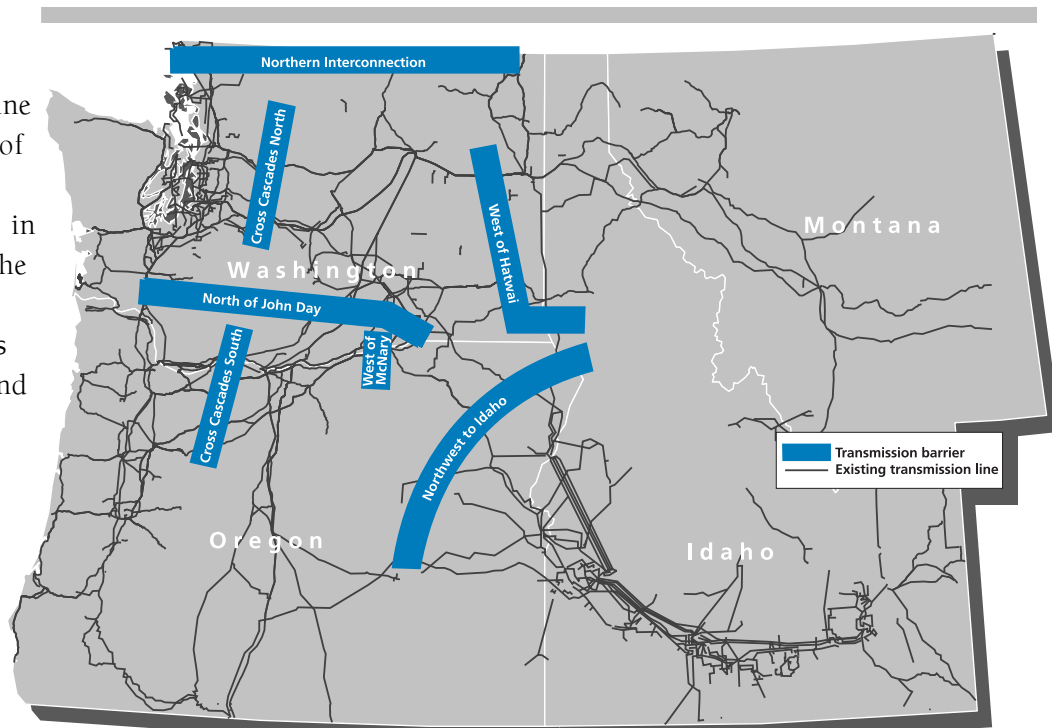
Congested paths

Congestion occurs when demand for power results in power flows beyond what the transmission system can safely handle. At times, some power can't be delivered; even worse, power overloads could lead to transmission system failure and power outages.

The Northwest has several paths facing severe congestion today. BPA and local utilities have plans in place to curtail generation in the Spokane-Northern Idaho and Puget Sound areas because of these constrained paths.

One of the most troublesome congested path is an area near Spokane, known to utilities as West of Hatwai. Utilities that operate generators ranging from the Colstrip coal plants in eastern Montana to hydro generation in western Montana and north of Spokane rely on BPA's system to deliver that power to consumers in the Interstate-5 corridor from Portland to Seattle. A number of factors, including shutdown of aluminum smelters beyond the West of Hatwai path and more stringent reliability standards, limit the amount of power that can be safely delivered. During the summer some low-cost generation must be shut down because it gets "bottlenecked." This problem is addressed by the Grand Coulee-Bell project, which would replace an existing 115-kV line with a 500-kV line.

Constraints in the heart of the Puget Sound area put consumers in that region at risk during the coldest months. In order to prevent a line outage from leading to widespread blackouts, utilities have implemented a



This map illustrates the congested transmission paths in the Northwest.

winter operating plan that disconnects some consumers if an emergency occurs. The Kangley-Echo Lake 500-kV line is designed to make curtailments unnecessary.

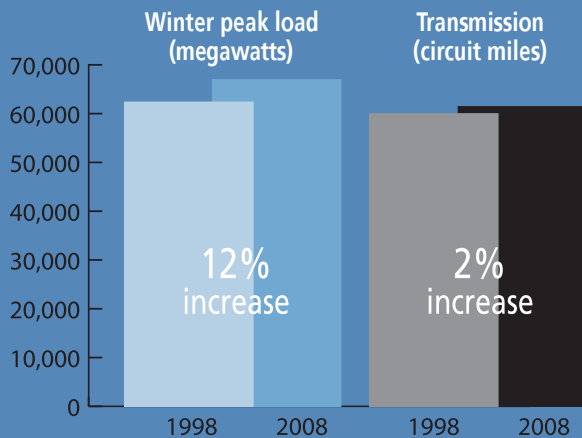
New generation means more transmission

According to a forecast by the Northwest Power Pool, the region's winter peak load will increase by 12 percent from nearly 60,000 megawatts in 1998 to almost 67,000 megawatts in 2008. At the same time, the total miles of Northwest transmission lines will increase by a mere 2 percent, not including the recommended infrastructure projects.

The existing transmission system cannot reliably deliver these additional resources unless essential improvements are made.

With the Northwest economy in recession, electrical demand is down and proposed generation projects may be deferred or cancelled. We don't want electrical supply and transmission limitations to become a "glass ceiling" to economic recovery. The existing transmission system cannot reliably deliver the additional resources that the region will need.

Transmission needs



Northwest winter peak loads are expected to increase by approximately 12 percent while the transmission system will grow by only 2 percent.

Data from NW Power Pool 10-year forecast.

BPA has a plan

The BPA infrastructure improvement projects are needed to maintain reliable transmission service to population centers, to integrate much-needed new generation, and to restore or enhance transfer capability across key paths.

Transfer capability is the amount of power that can be transmitted between one system and another. The projects are listed on page 5, along with the estimated times by which BPA would conclude its environmental processes and make decisions on where to build the projects (start date) and, the expected dates that each improvement would be added to the system (energization date). All dates are subject to change.

Each project is designed to assure that the BPA transmission system complies with recently adopted national and regional reliability standards. Some projects connect new generation to the grid and others restore or improve transmission capacity on congested paths that seriously impede the movement of electricity from generation to load.

BPA will work with tribal, state and federal governments as well as local landowners to determine the location of transmission projects. Projects outside

BPA substations will have public meetings to allow interested parties to comment, to identify impacts of various alternatives, and to ensure that the best alternative is selected.

Infrastructure project descriptions

Kangley-Echo Lake 500-kV Transmission Line Project

A proposed nine miles of transmission line and additions to two existing substations would increase transmission capacity to Puget Sound by about 600 megawatts. The project would serve increasing loads in Puget Sound and help return Canadian Entitlement power to Canada as required by the Columbia River Treaty. The proposed route crosses Seattle's Cedar River watershed. BPA is working with local, state and tribal officials and interest groups to ensure that the watershed is protected. The Final EIS is expected in Spring 2002. *Energization date: Winter 2002.*

Schultz-Hanford Area 500-kV Transmission Line Project

This 500-kV line up the middle of the Columbia River Basin will ease electricity flows in the I-5 corridor and over the Intertie lines to California. That's because power flows over the path of least resistance, and the lines in the heart of the grid these days are often fully loaded. The Schultz-Hanford project will add 600 megawatts of transfer capacity to the heart of BPA's grid. The line would connect BPA's Schultz Substation near Ellensburg to a new or existing substation near the Department of Energy's Hanford Reservation and will cross the Hanford Reach National Monument and the U.S. Army's Yakima Firing Range. BPA is working with the public, state and federal agencies, and Indian tribes to reach agreement on the best specific location. The Draft EIS is available, and the public comment period closes on March 25, 2002. *Energization date: Fall 2004.*

McNary-John Day 500-kV Transmission Line Project

This 79-mile-long project would add about 1,200 MW of transfer capacity along the Columbia River from the Tri-Cities to The Dalles-John Day area. Existing lines are fully loaded, and many new power

plants are proposed or under construction in this area. The line is needed to provide capacity to help integrate new gas and wind generation in the area. The route, which starts and ends in Oregon, is mostly on the Washington side of the Columbia River on vacant BPA right-of-way. This project, like the following two, is contingent upon the generation developers signing a long-term transmission agreement. The power plant sponsors are paying for the environmental review of this transmission project. The Draft EIS is expected in Spring 2002. *Energization date: Fall 2004.*

Starbuck Power Project

This 15-mile, 500-kV line and substation would integrate 1,200 MW of new generation proposed at Starbuck, Wash., into the grid. The power plant sponsors are paying for environmental review of the transmission project. The Draft EIS is expected in Spring 2002. *Energization date: Fall 2004.*

Wallula-McNary 500-kV Transmission Line Project

This 33-mile, 500-kV line would integrate power from a 1,300 MW power plant at Wallula into the grid. The power plant sponsors are paying for environmental review of the transmission project. The Draft EIS is

available, and the public comment period closes on April 11, 2002. *Energization date: Fall 2004.*

Schultz Series Capacitors

Series capacitors boost voltage when it sags over long transmission distances and are a major tool for reinforcing a transmission grid short of building new lines. BPA has added a lot of capacitor banks in the last decade. This project will help prevent voltage collapse in the Puget Sound area and further delay the need for a new cross-Cascades line. The environmental review is done. *Energization date: Winter 2003.*

Celilo Modernization Project

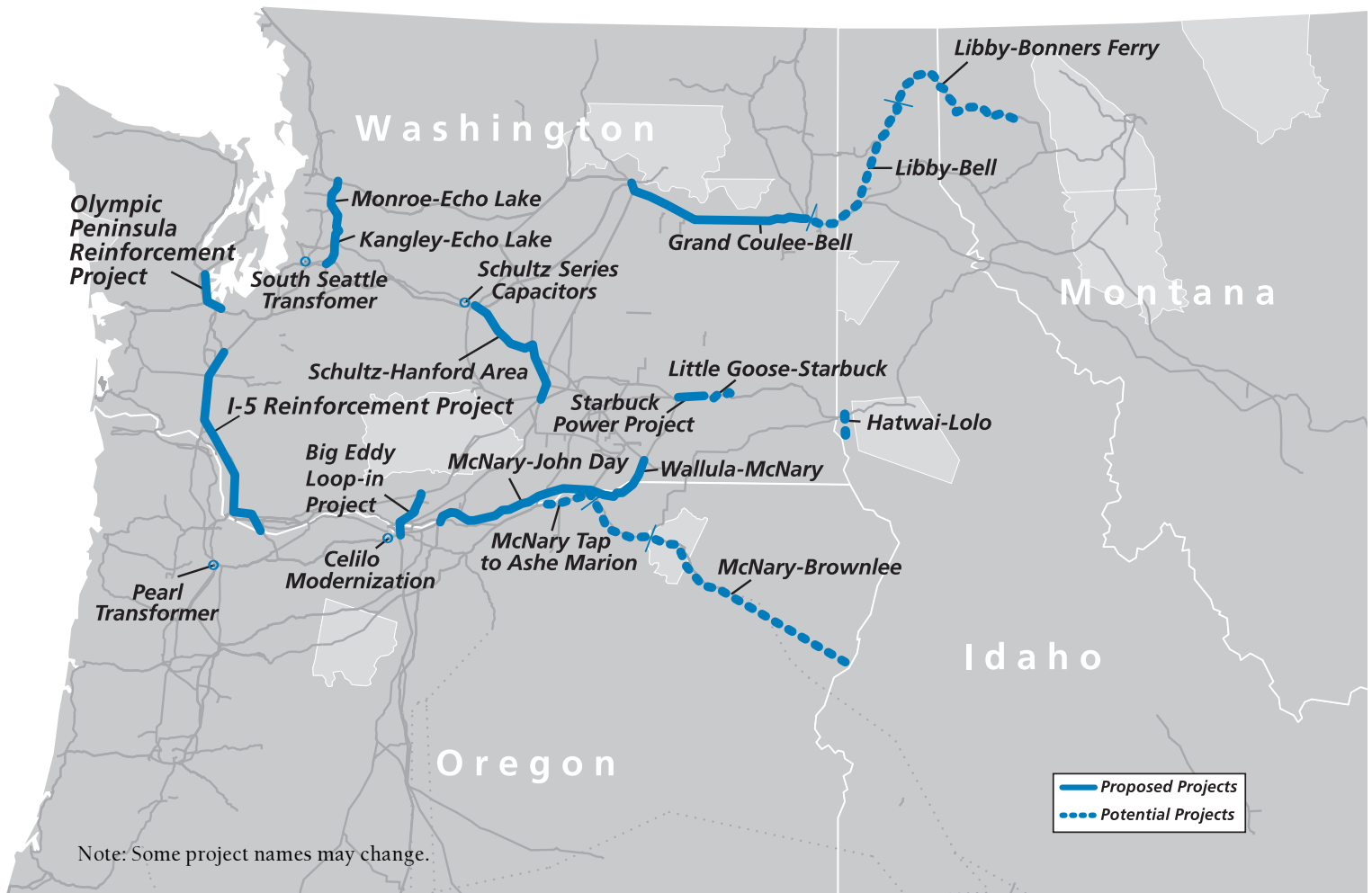
This project will finally replace the last of the original mercury-arc converters at the Celilo Converter Station with solid-state silicon-based thyristors. It's like trading in a Roosevelt-era radio on a boom box. Celilo is the northern end of the DC Intertie to Los Angeles. The work will maintain the DC Intertie's transfer capacity at 3,100 MW instead of allowing it to degrade to 1,100 MW. The Los Angeles Department of Water and Power is also scheduled to rebuild its Sylmar Converter Station on the southern end of the line. The environmental review is done. *Energization date: Summer 2004.*

The BPA Infrastructure Improvement Projects

	Start Date	Energization Date
Kangley-Echo Lake 500-kV Transmission Line Project	Spring 2002	Winter 2002
Schultz-Hanford Area 500-kV Transmission Line Project	Spring 2003	Fall 2004
McNary-John Day 500-kV Transmission Line Project	Fall 2002	Fall 2004
Starbuck Power Project	Summer 2002	Fall 2004
Wallula-McNary 500-kV Transmission Line Project	Summer 2002	Fall 2004
Schultz Series Capacitors	Spring 2002	Winter 2003
Celilo Modernization Project	Spring 2002	Summer 2004
Monroe-Echo Lake 500-kV Transmission Line Project	Fall 2003	Fall 2005
Grand Coulee-Bell 500-kV Transmission Line (Eastern Washington Reinforcement) Project	Winter 2002	Fall 2004
Pearl 500/230-kV Transformer*	Spring 2002	Fall 2003
Olympic Peninsula Reinforcement Project*	Fall 2002	Fall 2005
I-5 Reinforcement Project*	Spring 2003	Spring 2006
Big Eddy Loop-in Project*	Spring 2004	Spring 2006

*These are not the official project names and could change.

Infrastructure projects



Monroe-Echo Lake 500-kV Transmission Line Project

This 32-mile, 500-kV project would add another 600 MW south-to-north and 850 MW north-to-south to transmission capacity through and north of Puget Sound. It would ease loading on other lines and add a reliability margin. This is another in the suite of projects designed to keep the lights on in Puget Sound and to assure reliable return of entitlement power to Canada. Environmental review of this project has not yet begun. BPA is examining non-transmission solutions to delay or defer the project. It is contingent on generation developers and Canadian exporters signing long-term transmission agreements for part or all of the capacity. *Energization date: Fall 2005.*

Grand Coulee-Bell 500-kV Transmission Line (Eastern Washington Reinforcement) Project

This would replace about 84 miles of existing 115-kV line with 500-kV line from Grand Coulee Dam to Spokane. It would initially add about 700 MW of transmission capacity on a very constrained path across northeast Washington and, with other upgrades being considered, would add a total of 1,200 MW. It's needed to support existing power transfer agreements and maintain stability on the entire West Coast. The Draft EIS will be available in Summer 2002. *Energization date: Fall 2004.*

Pearl 500/230-kV Transformer*

Adds a second 500/230-kV transformer at Pearl Substation to provide reliable load service to the Portland area. Without this project, an outage of

the existing Pearl transformer would overload the McLoughlin 500/230-kV bank and/or the McLoughlin-Pearl 230-kV line by 2004. The environmental review has not started. *Energization date: Fall 2003.*

Olympic Peninsula Reinforcement Project*

Relocates the Satsop 500/230-kV transformer to Shelton Substation and constructs a new 20 mile, Olympia-Shelton 500-kV line. This project is needed to solve voltage stability problems on the Olympic Peninsula as well as to mitigate for circuit breaker failures and other contingencies in the Olympia/Shelton area. The environmental review has not started. *Energization date: Fall 2005.*

I-5 Reinforcement Project*

Constructs a new, 105-mile Paul-Longview-Troutdale 500-kV line. It also includes a new 500/230-kV substation in the Longview area. These additions are needed to reliably integrate several new generator additions along the I-5 corridor. This addition will increase the transfer capability on the I-5 corridor (South of Paul) by approximately 1100 MW. The environmental review has not started. *Energization date: Spring 2006.*

Big Eddy Loop-in Project*

Constructs 20 miles of double-circuit, 500-kV line to loop the existing Hanford-Ostrander 500-kV line into Big Eddy Substation. This project provides some reinforcement to the North of John Day constrained path as well as provides increased reliability of load service to the Portland Area during cold weather. The environmental review has not started. *Energization date: Spring 2006.*

An additional seven projects have been identified, but are not fully developed (see map on page 6). These include addressing load service problems and constraints in northwestern Montana, limitations on imports from Montana and exports to Idaho as well as integration of additional potential generation. Project locations on the map are preliminary.

Non-transmission alternatives

Options to expanding the grid include further increasing energy conservation, pricing strategies, demand reduction and strategic placement of generators. BPA is encouraging all of these approaches. The agency is a major supporter of fuel cell development and is working with its utility customers to develop an approach to conservation that will assure that it receives attention when power is inexpensive as well as when it is expensive. While BPA can encourage and support distributed generation and conservation, it cannot compel any utility or group of people to adopt either. In its planning, BPA has estimated the level of distributed generation and conservation the region will adopt. These non-wire solutions were taken into account before the projects were designed.

Before proceeding with the construction of transmission projects, BPA wants to ensure it is providing the most cost-effective solution to the region's transmission problems from an engineering, economic and environmental standpoint. As part of its evaluation, BPA will consider whether non-transmission options can be employed as viable alternatives to transmission expansion.

To this end, BPA commissioned a group of consultants to recommend enhancements to the planning process and to suggest which of the projects might be candidates for non-transmission initiatives. The resulting report, "Expansion of BPA Transmission Planning Capabilities: A Report On Non-Transmission Alternatives" has been released for review and comment and is available on the Web at: http://www.transmission.bpa.gov/tbllib/Publications/Infrastructure/default_files/slide0001.htm

Infrastructure financing

The estimated total cost of the first nine infrastructure projects is approximately \$680 million. Assuming that 5,000 to 5,500 megawatts of the potential 12,000 megawatts of new generation is brought on line over the next five years, the corresponding use of the transmission system would recover these costs. If more generation materializes,

*These are not the official project names and could change.

the result will likely be lower transmission rates than would otherwise be the case.

The President's 2003 budget includes an additional \$700 million in borrowing authority for all BPA's infrastructure projects. When BPA borrows from the Treasury to construct transmission facilities, it recovers costs through sale of transmission services and repays its loans with interest, so there is no burden on the nation's taxpayers. The region's governors and the Northwest congressional delegation agree that an increase in BPA's borrowing authority is needed.

In addition, BPA is investigating (1) whether third parties are interested in financing of or other participation in infrastructure projects and (2) optimization of existing debt such that current borrowing authority could be extended to help finance the projects. No single approach is likely to prove adequate to meet the capital demands for the entire slate of infrastructure projects so BPA is exploring the creation of several financing options for individual projects.

Waiting for formation of the Northwest's regional transmission organization (RTO) before making major improvements to the existing system is not a good idea because of the timeline. The RTO won't become

operational until 2005, at the earliest, and it takes two to five years to design a project, complete the environmental reviews, build and energize it. That would push back completion of the infrastructure projects to the 2006-2009 timeframe. The region cannot afford to wait if it is to enjoy renewed economic growth. Reliable electricity is essential to expanding business, industry and jobs. BPA is coordinating its infrastructure planning with Northwest utilities.

For more information

If you'd like more information about BPA's infrastructure improvement projects, visit the Transmission Business Line Web site. A complete description of each project can be found at: http://www.transmission.bpa.gov/tbllib/Publications/Infrastructure/Final_With_Maps.pdf. See Appendix D and Appendix I.

To order additional copies of this publication, call BPA's Public Information Center at (503) 230-7334 in Portland, or outside Portland at 1-800-622-4520.

